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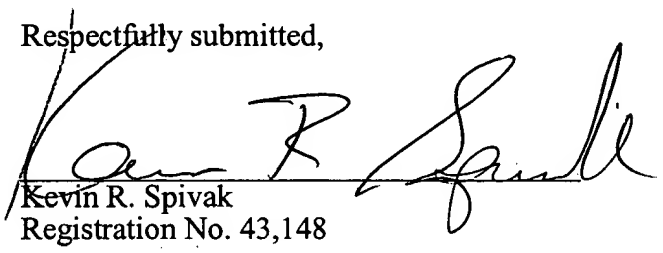
Respectfully submitted,

Dated: May 24, 2001

By: 

Kevin R. Spivak
Registration No. 43,148

Morrison & Foerster LLP
2000 Pennsylvania Avenue, N.W.
Washington, D.C. 20006-1888
Telephone: (202) 887-6924
Facsimile: (202) 263-8396

VERSION WITH MARKINGS TO SHOW CHANGES MADE

For the convenience of the Examiner, the changes made are shown below with deleted text in strikethrough and added text in underline.

In the Specification:

On page 1, before the first paragraph, has been amended to include the following insert:

This application claims priority to International Application No. PCT/DE99/01074 which was published in the German language on October 28, 1999.

On page 1, before the first paragraph, please delete the following:

~~Description~~

On page 1, between lines 3 and 4, please insert the following heading:

TECHNICAL FIELD OF THE INVENTION

Please replace the paragraph beginning at page 1, line 4, with the following rewritten paragraph:

The invention relates to a protective switching device, and in particular, to a differential-current circuit breaker~~,~~ having a core-balance transformer which monitors a line network and which, via a tripping circuit and an actuation circuit, actuates a release which is coupled to a switching mechanism in order to operate a power breaker.

On page 1, between lines 10 and 11, please insert the following heading:

BACKGROUND OF THE INVENTION

Please replace the paragraph beginning at page 1, line 10, with the following rewritten paragraph:

Such a protective switching device is described in (US-A-4 001 646). The protective switching device is used to ensure protection against a dangerous body current in an electrical system. ~~This is the case, f~~ For example, when someone touches a live part of an electrical system, ~~The~~ the fault current then flows via the person as a body current to ground. The circuit breaker which is used for protection against dangerous body currents safely and rapidly isolates the relevant circuits from the mains power supply when the so-called rated fault current is exceeded.

Please replace the paragraph beginning at page 1, line 20, with the following rewritten paragraph:

The construction of a circuit breaker is ~~known~~ described, for example, from "etz", Volume 107 (1986), issue 20, pages 938 to 945. There, Figures 1 to 3 in particular show basic circuit diagrams and functional principles of a fault-current circuit breaker (FI circuit breaker) and a differential-current circuit breaker (DI circuit breaker).

Please replace the paragraph beginning at page 2, line 23, with the following rewritten paragraph:

Furthermore, a remote release is frequently provided in such circuit breakers, via which - for example for disconnection - the circuit breaker and thus the power breaker coupled to it can be operated externally. In order to provide a remote release for a DI circuit breaker, one option is for a ~~make~~ mate contact to be connected in parallel with the test contact via a remote tripping line connected to said DI circuit breaker. Another option is for a separate winding to be provided in addition to the test winding on the corebalance transformer, ~~which~~ The separate winding is connected between two external conductors or between one phase conductor and the neutral conductor via a current limiting resistor, for operation of a remote tripping switch. These two versions for remote tripping on the one hand also require at least one auxiliary contact, however, in a disadvantageous manner. On the other hand, the feeders to the remote tripping switch and

the switch contact for the remote release must be designed for a particularly high withstand voltage.

Please replace the paragraph beginning at page 3, line 4, with the following rewritten paragraph:

In the case of a DI accessory for power breakers, an additional exacerbating factor is that no auxiliary contacts can be provided owing to the switching paths accommodated in the power breaker. Since such circuit breakers are also designed with three poles, a connection between two ~~external~~ outer conductors would also be required. Furthermore, a particular feature of DI circuit breakers or accessories is that tripping time delays of up to one second can frequently be set. Thus, if the remote release were operated according to the said variants, a relatively long tripping time would have to be taken into account - depending on the time delay setting. However, this is unacceptable with regard to emergency disconnection.

On page 3, between lines 17 and 18, please insert the following headings and paragraphs:

SUMMARY OF THE INVENTION

In one embodiment of the invention, there is a protective switching device including a corebalance transformer which monitors a line network and actuates a release which, via a tripping circuit and an actuation circuit, is coupled to a switch mechanism in order to operate a power breaker, wherein a tripping circuit, which can be tripped by a remote tripping signal, is connected to a transformer which can be actuated on the secondary side and whose primary side is connected to an actuation circuit of the release.

In one aspect of the invention, if the secondary of the transformer is short-circuited, the tripping circuit produces a control signal for the actuation circuit of the release.

In another aspect of the invention, the tripping circuit comprises an oscillator which is connected to the primary side of the transformer.

In yet another aspect of the invention, the oscillator is a square-wave generator whose frequency is set to between 500 Hz and 5 Hz.

In still another aspect of the invention, the protective switching device wherein the tripping circuit has a comparator which is connected on the primary side to the transformer and is connected on the output side to the actuation circuit for the release.

In another aspect of the invention, the protective switching device wherein the tripping circuit has a non-reactive resistor RS > 10 kΩ which is connected to the primary winding of the transformer.

In another aspect of the invention, the tripping circuit has a reference signal source having a voltage divider which is fed from a supply voltage, via a zener diode.

In yet another aspect of the invention, a secondary of the transformer is connected to ground potential via a resistor series circuit.

In still another aspect of the invention, the actuation circuit comprises a comparator with a downstream controllable electronic switch, which is connected to the release.

In yet another aspect of the invention, the controllable switch is a transistor whose base control input is connected to the comparator and in whose collector-emitter circuit a tripping relay coil of the release is connected.

BRIEF DESCRIPTION OF THE DRAWINGS

An exemplary embodiment of the invention will be explained in more detail in the following text with reference to a drawing.

Figure 1 shows the design of a DI circuit breaker with a tripping circuit for remote tripping.

Figure 2 shows the circuit design of the tripping circuit shown in Figure 1.

Mutually corresponding parts are provided with the same reference symbols in both figures.

DETAILED DESCRIPTION OF THE INVENTION

Please replace the paragraph beginning at page 3, line 18, with the following rewritten paragraph:

The invention discloses ~~is thus based on the object of specifying~~ a protective switching device~~, in particular a DI circuit breaker,~~ which can be tripped remotely in a ~~simple and reliable manner while avoiding the said disadvantages~~ simpler and more reliable manner.

On page 3, please delete lines 23-26.

~~This object is achieved according to the invention by the features of claim 1. A tripping circuit is provided for this purpose, which actuates the release when remote tripping takes place.~~

Please replace the paragraph beginning at page 4, line 17, with the following rewritten paragraph:

In one embodiment ~~expedient refinement~~, the tripping circuit has a comparator which is connected on the primary ~~side~~ site to the transformer and is connected on the output side to the actuation circuit of the release. It is thus possible to set a response threshold for the release for remote tripping by comparing the signal on the primary side of the transformer with a reference signal in order to produce an appropriate actuation signal.

Please replace the paragraph beginning at page 5, line 15, with the following rewritten paragraph:

In order to prevent an electrostatic charge on the line which is connected to the transformer for remote tripping, the secondary of the transformer is expediently connected to ground potential ~~via~~ by a series of circuits comprising at least two non-reactive resistors.

Please replace the paragraph beginning at page 5, line 28, with the following rewritten paragraph:

The ~~advantages achieved by the~~ invention ~~are, in particular, that~~ can achieve remote tripping without any auxiliary contact ~~is possible~~ by ~~means of~~ a tripping circuit which acts on the release of a protective switching device connected on the secondary side of a corebalance transformer and has a transformer whose primary is connected to the release. Furthermore, there is no need for any special requirements for the withstand voltage of the remote tripping line and the remote tripping switch. Since the tripping circuit acts directly via the actuation circuit on the release, there is virtually no ~~time~~ delay in the actuation for remote tripping of a circuit breaker with a tripping time delay, so that safe emergency disconnection is ensured by remote tripping of the circuit breaker.

On page 6, please delete lines 9-18.

~~An exemplary embodiment of the invention will be explained in more detail in the following text with reference to a drawing, in which:~~

~~Figure 1 shows, schematically, the design of a DI circuit breaker with a tripping circuit for remote tripping, and~~

~~Figure 2 shows the circuit design of the tripping circuit shown in Figure 1.~~

~~Mutually corresponding parts are provided with the same reference symbols in both figures.~~

Please replace the paragraph beginning at page 6, line 33, with the following rewritten paragraph:

The comparator 13 is connected on the output side to a controllable electronic switch which~~, for its part,~~ is connected to the release 4. In the exemplary embodiment, the switch is a bipolar npn transistor 14, whose base is actuated by the comparator 13 and in whose collector-emitter circuit, which is connected to an operating voltage UB, a tripping ~~relay~~ release coil 15 of the release 4 is connected. The release 4 is coupled to a mechanism in the form of a switching mechanism 16 which acts on a switching path, connected in each line of the line network Ln, of a power breaker 18.

Please replace the paragraph beginning at page 7, line 9, with the following rewritten paragraph:

When the DI circuit breaker is operating in the absence of any faults, the vectorial sum of the currents flowing in the two directions in the line network is equal to zero. However, if a fault current via ground occurs, for example as a result of an insulation fault in a load device (not illustrated), then this interferes with the current equilibrium in the core-balance transformer 6. The transformer core 7 is magnetized in a corresponding way to the magnitude of the fault current, so that a voltage is induced in the secondary winding 8 of the core-balance transformer 6. A corresponding amplified, rectified and ~~delayed~~ a time-delay tripping signal S_s, is supplied to the actuation circuit 3 of the release 4. When the release 4 responds, the switching paths of the power breaker 18 are opened via the switching mechanism 16, and the damaged part of the system is in consequence disconnected.

Please replace the paragraph beginning at page 7, line 26, with the following rewritten paragraph:

The release 4 can furthermore be actuated by ~~means of~~ remote tripping. To this end, the tripping circuit 5 comprises a transformer 20 having a primary winding Nl and a secondary winding N2, via which the tripping circuit 5 can be activated by means of a remote tripping signal ~~S_f~~ S_s. A square-wave oscillator 22 acts on the primary winding Nl of the transformer 20. If the secondary of the transformer 20 is short-circuited, then the voltage across the primary winding Nl of the transformer 20 collapses. This is detected by a comparator 24 connected on the primary side to the transformer 20. On exceeding a reference voltage U_{Ref}, the comparator 24 acts on the tripping circuit 2 to actuate the tripping relay coil 15 of the release 4, by the tripping circuit 5 supplying the comparator 13 of the actuation circuit 3 with an appropriate control signal S_s. In this case, this action takes place after the tripping circuit 2, and thus after the tripping time delay 12, if such a tripping time delay 12 is provided.

In the Claims:

1. (Amended) A protective switching device~~, in particular a differential current circuit breaker, having~~ comprising:

a corebalance transformer ~~(6)~~ which monitors a line network ~~(Ln)~~ and actuates a release ~~(4)~~ which, via a tripping circuit and an actuation circuit, is coupled to a switch~~ing~~ mechanism ~~(16)~~ in order to operate a power breaker ~~(18)~~, ~~characterized by~~ wherein a tripping circuit ~~(5)~~, which can be tripped by a remote tripping signal, is connected to ~~having~~ a transformer ~~(20)~~ which can be actuated on the secondary side and ~~is connected on the~~ whose primary side is connected to an actuation circuit ~~(13)~~ of the release ~~(4)~~.

2. (Amended) The protective switching ~~devices~~ device claimed in claim 1, ~~characterized in that~~ wherein, if the secondary of the transformer ~~(20)~~ is short-circuited, the tripping circuit ~~(5)~~ produces a control signal ~~(S_s)~~ for the actuation circuit ~~(13)~~ of the release ~~(4)~~.

3. (Amended) The protective switching ~~devices~~ device claimed in claim 1 ~~or 2~~, ~~characterized in that~~ wherein the tripping circuit ~~(5)~~ comprises an oscillator ~~(22)~~ which is connected to the primary side of the transformer ~~(20)~~.

4. (Amended) The protective switching ~~devices~~ device claimed in claim 3, ~~characterized in that~~ wherein the oscillator ~~(22)~~ is a square-wave generator whose frequency ~~(F)~~ is set to between 500 Hz and 5 Hz.

5. (Amended) The protective switching ~~devices~~ device claimed in ~~one of claims 1 to 4~~ claim 1, ~~characterized in that~~ wherein the tripping circuit ~~(5)~~ has a comparator ~~(24; V2)~~ which is connected on the primary side to the transformer ~~(20)~~ and is connected on the output side to the actuation circuit ~~(13)~~ for the release ~~(4)~~.

6. (Amended) The protective switching ~~devices~~ device claimed in ~~one of claims 1 to 5~~ claim 1, ~~characterized in that~~ wherein the tripping circuit ~~(5)~~ has a non-reactive resistor RS $\geq$ 10 kΩ which is connected to the primary winding ~~(N1)~~ of the transformer ~~(20)~~.

7. (Amended) The protective switching ~~devices~~ device claimed in ~~one of claims 1 to 6~~ claim 1, ~~characterized in that~~ wherein the tripping circuit ~~(5)~~ has a reference signal source having a voltage divider ~~(R7, R8)~~ which is fed from a supply voltage ~~(U_v)~~, via a zener diode ~~(D2)~~.

8. (Amended) The protective switching ~~devices~~ device claimed in ~~one of claims 1 to 7~~ claim 1, ~~characterized in that~~ wherein a secondary of the transformer ~~(20)~~ is connected to ground potential ~~(PE)~~ via a resistor series circuit ~~(R11, R12)~~.

9. (Amended) The protective switching ~~devices~~ device claimed in ~~one of claims 1 to 8~~ claim 1, ~~characterized in that~~ wherein the actuation circuit comprises a comparator ~~(13)~~ with a downstream controllable electronic switch ~~(14)~~, which is connected to the release ~~(4)~~.

10. (Amended) The protective switching device as claimed in claim 9, ~~characterized in that~~ wherein the controllable switch is a transistor ~~(14)~~ whose base control input is connected to the comparator ~~(13)~~ and in whose collector-emitter circuit a tripping relay coil ~~(15)~~ of the release ~~(4)~~ is connected.

In the Abstract:

Please replace the Abstract in its entirety with the Abstract attached hereto.